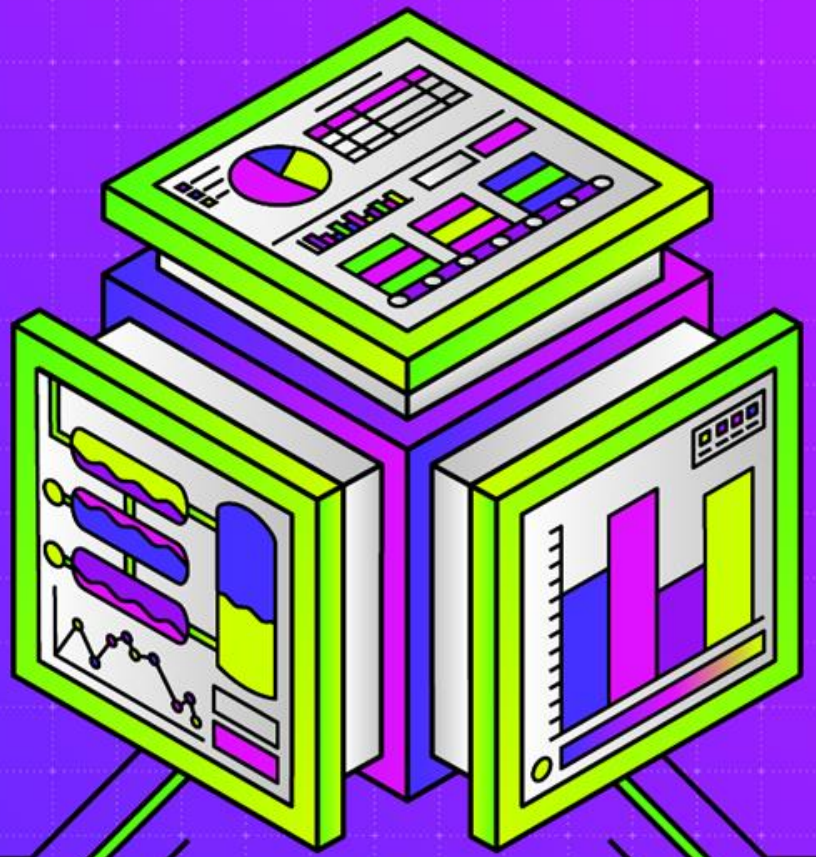
Design Like a Pro:
Exceptional Industry-Specific HMIs



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Kent Melville

Director of Sales Engineering

Inductive Automation

Mara Pillott

Application Engineering Manager

Inductive Automation

Guest Presenters

Alex Marcy

Founder and CEO

Corso Systems

Frank Peronace

Controls Manager

Kupper Engineering

Chris Monchinski

VP of Manufacturing Intelligence

Automated Control Concepts

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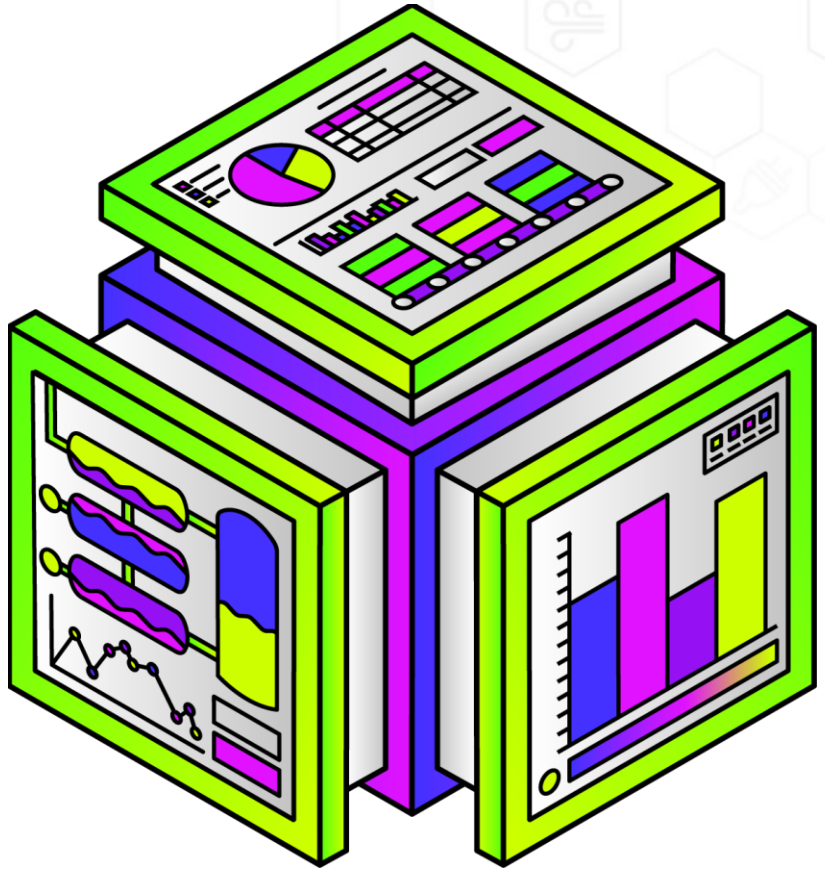
Agenda

- Cross-Industry “Building Blocks”
- Real-World HMI Examples
- Audience Q&A



Cross-Industry “Building Blocks”

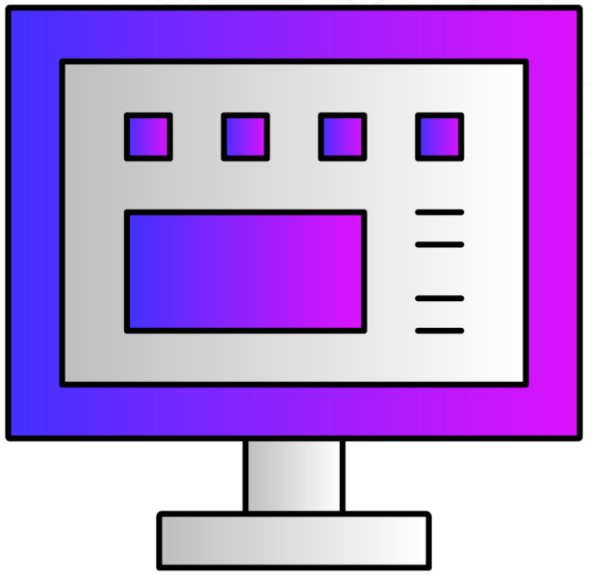
General Design Concepts

- Navigation Structure
- Reusability
- High-Performance HMI Techniques
- Alarm Management
- Responsiveness

Navigation

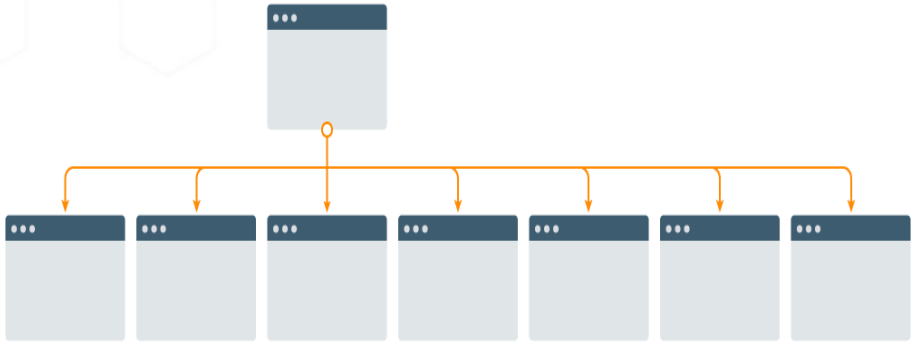
Navigation

- Strategy
- Layout
- Limiting Clicks

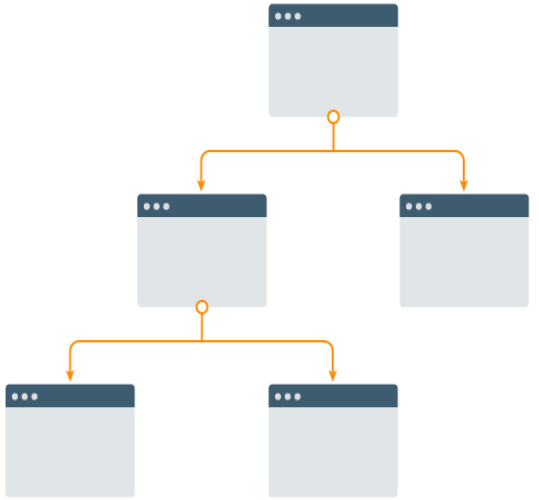


Determine Your Navigation Structure

Broad and Shallow



Narrow and Deep

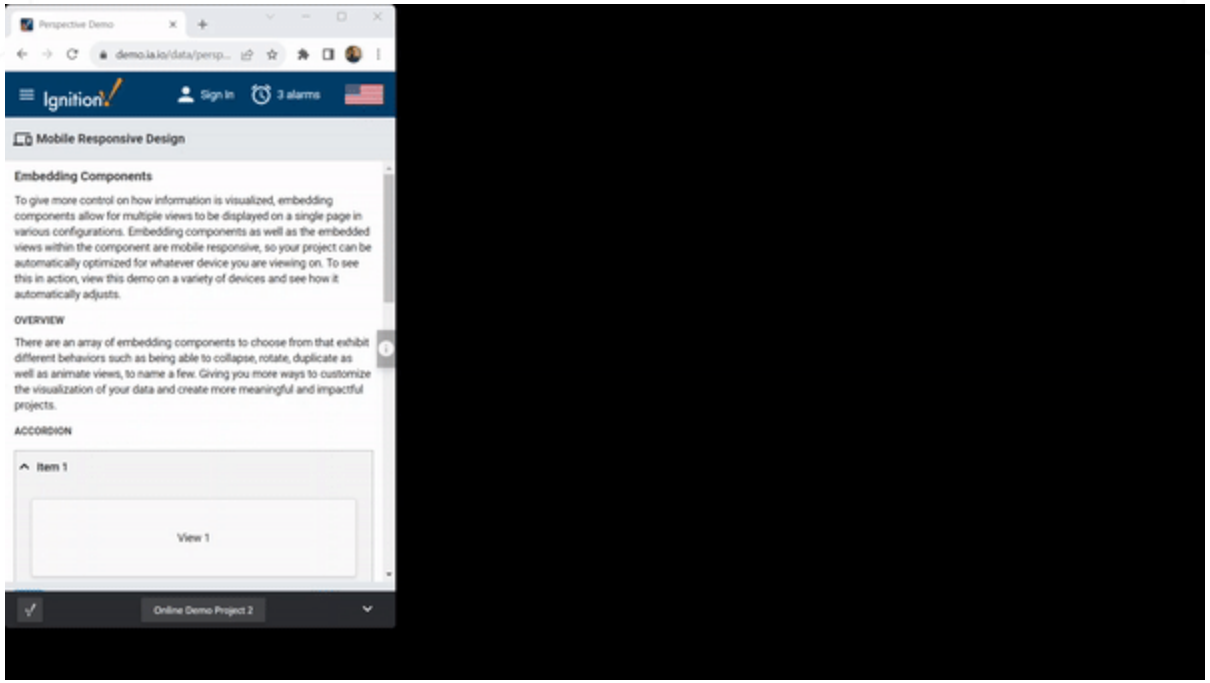


Determine Your Navigation Layout

Screen layout

- Primary Top Header
- Secondary Top Header
- Side Navigation
- Tabs

Mobile-Responsive Navigation



Reusability

Why Reusable Objects?

- Saves development time
- Save maintenance time
- Consistent

Reusable Objects

- Projects
- UDTs
- Templated Views

Reusability: Projects

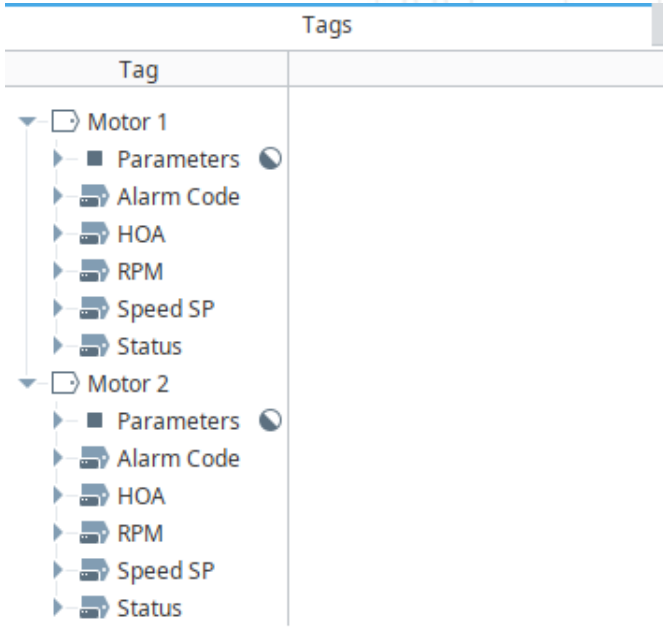
Project Inheritance

- Consistency
- Shared Resources
- Global Project
- Multi Level

Reusability: UDTs

User Defined Types (UDTS)

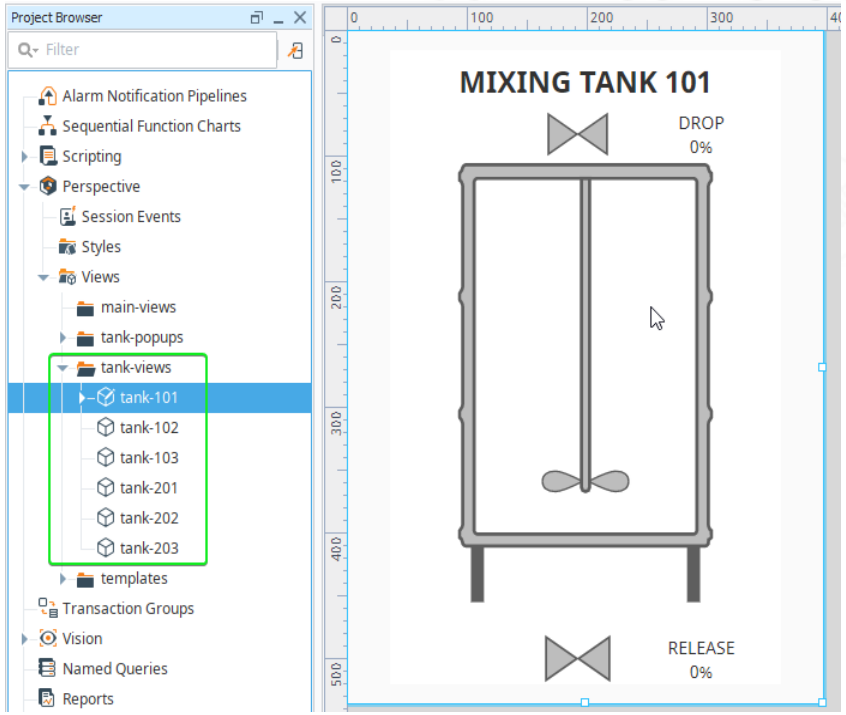
- Group of tags and properties representing an object,
- UDTs ensure consistent structure.
- Tag addresses can be parameterized and multiple UDT instances can be created with just a few clicks.
- Reusable views or templates can easily be built from a UDT.
- Modifications to structure on a UDT can be made on the definition and changes apply to all instances automatically. No more repetitive copy/paste!



Reusability: Templated Views

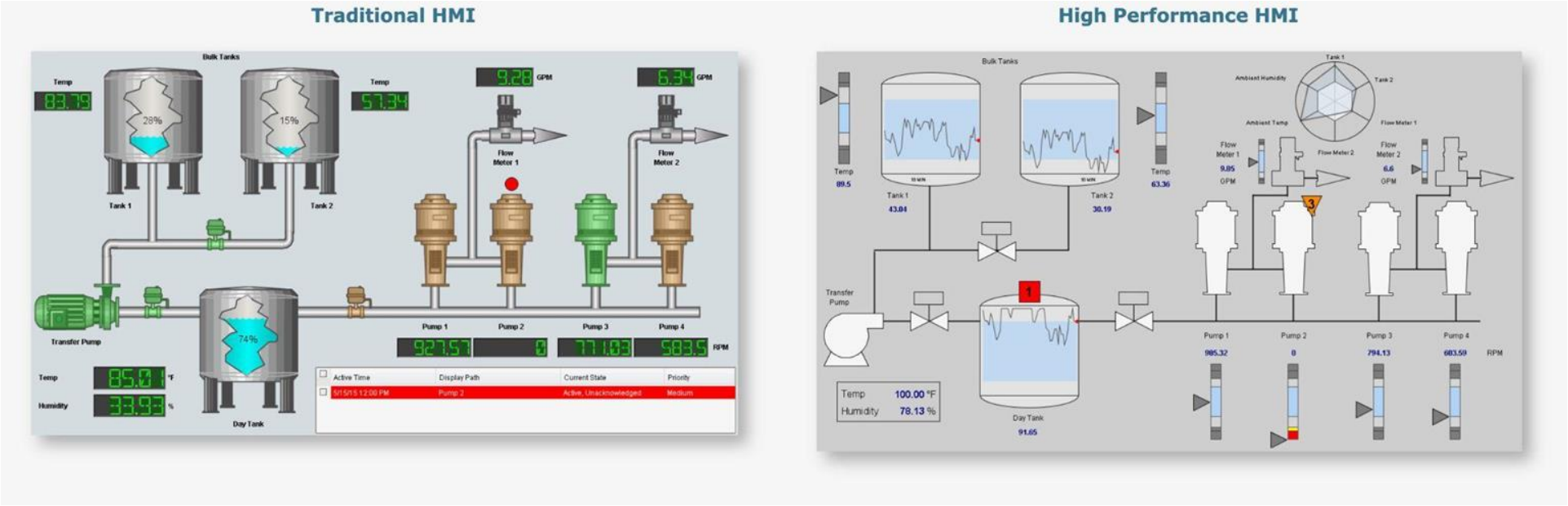
Reusing Views

- Create once - use over and over
- Maintain in one place
- Use anywhere in your project:
  - Main view
  - Popup
  - Embedded view
  - Flex Repeaters



High-Performance HMI

- Color and Indicators
- Analog vs Digital
- Data with context
- Sparklines

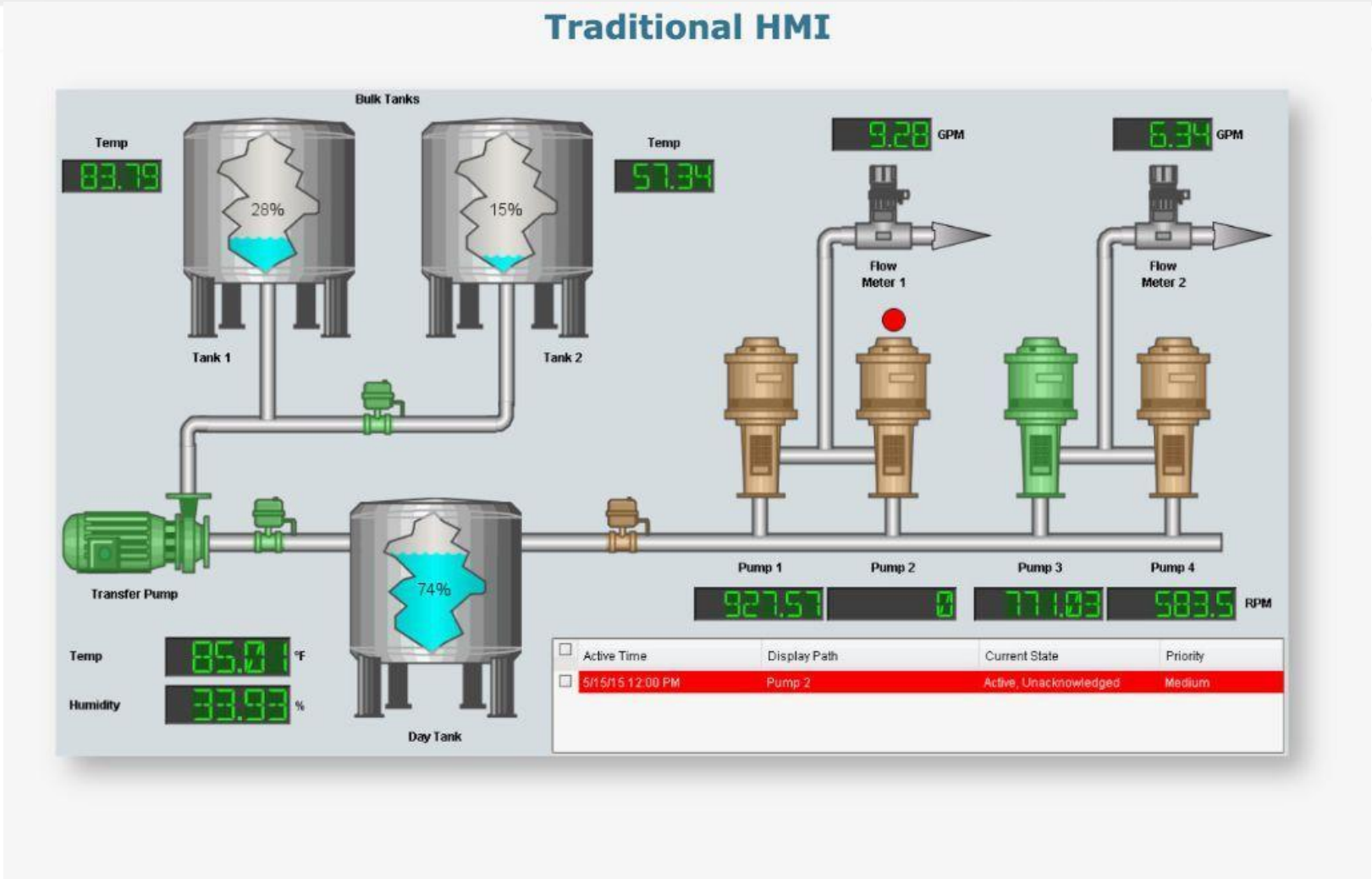


High-Performance HMI: Color and Indicators

- Color where attention is needed.

VS

- Color everywhere



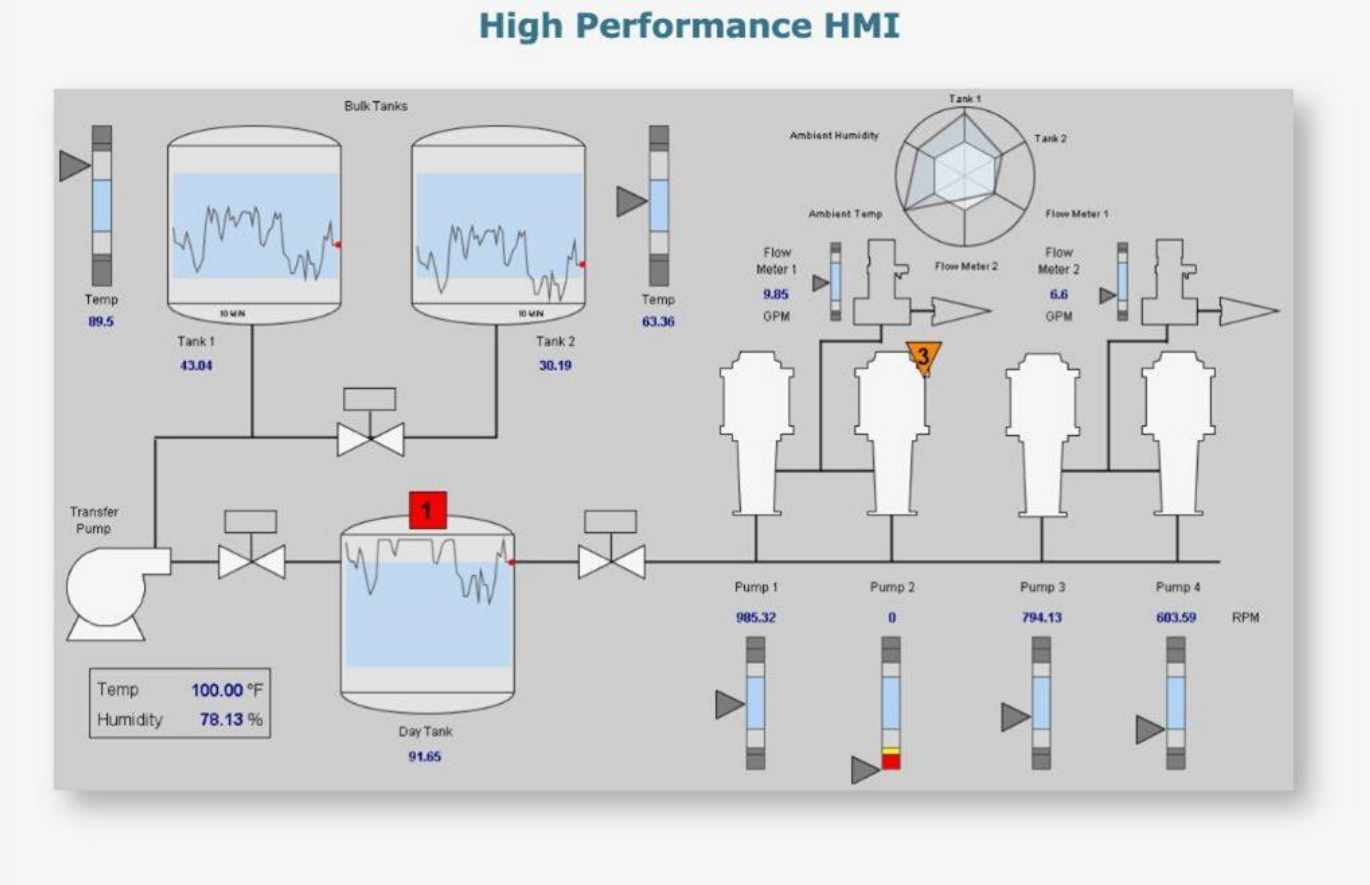
High-Performance HMI: Color

Color

Which square stands out?

High-Performance HMI: Color and Indicators

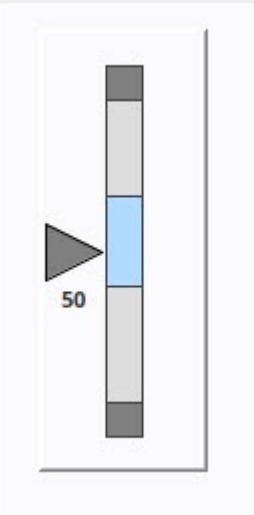
- Color where attention is needed.
- Numeric indicators and shapes for priority



High-Performance HMI: Analog vs Digital

Moving analog indicators

- Displays an analog value as an arrow pointing at a bar with segments showing the desired operating range



Digital Display

- Displays a value without meaning. Desired range is unknown.

High-Performance HMI: Data with Context

Example: Blood Pressure Reading

Blood Pressure: 122/93

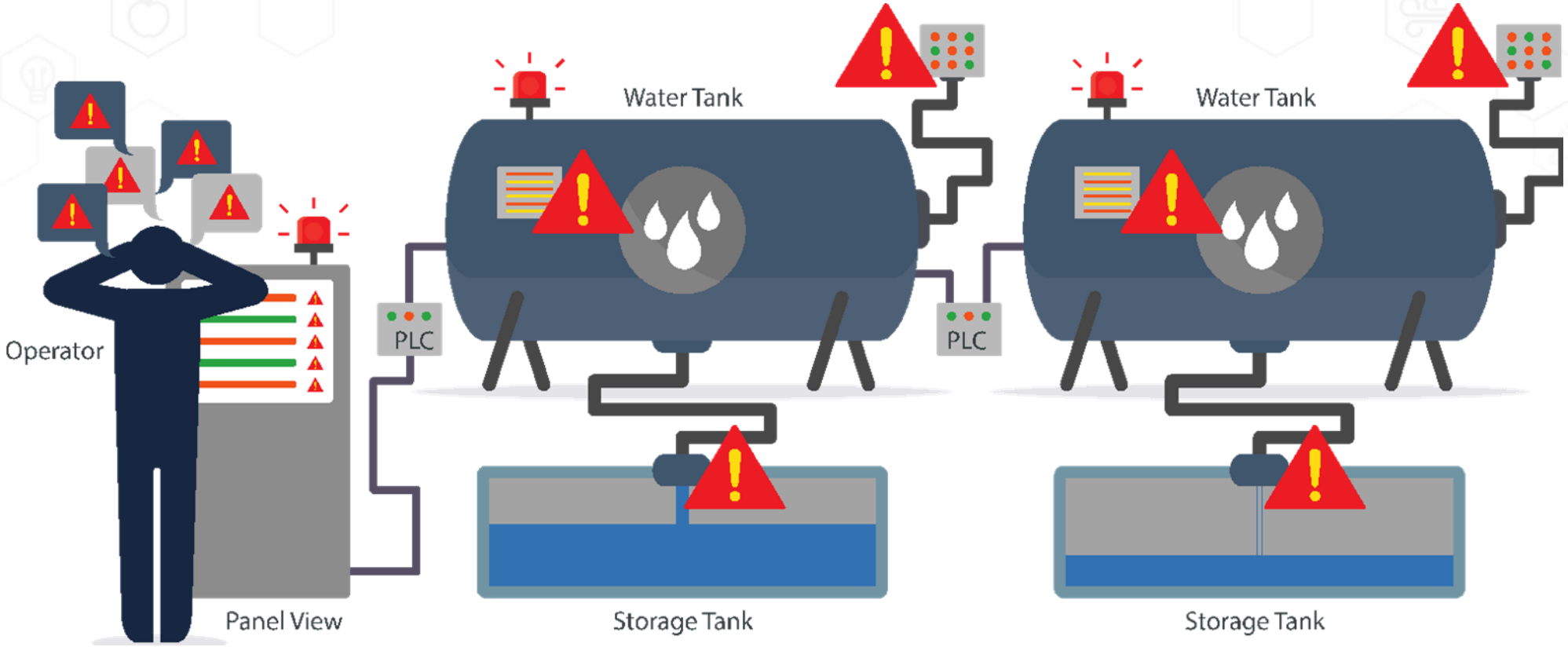
	Systolic	Diastolic
Normal		
Pre-Hypertension	122	
High Blood Pressure Stage 1		93
High Blood Pressure Stage 2		
Hypertensive Crisis		

High-Performance HMI: Sparkline

Sparklines

- Minimalistic chart component that displays a line-chart history for a single datapoint
- Show contextual information in a very small amount of space
- Typically used to display the recent history to quickly discern the recent trend

A Poorly Managed Alarm System



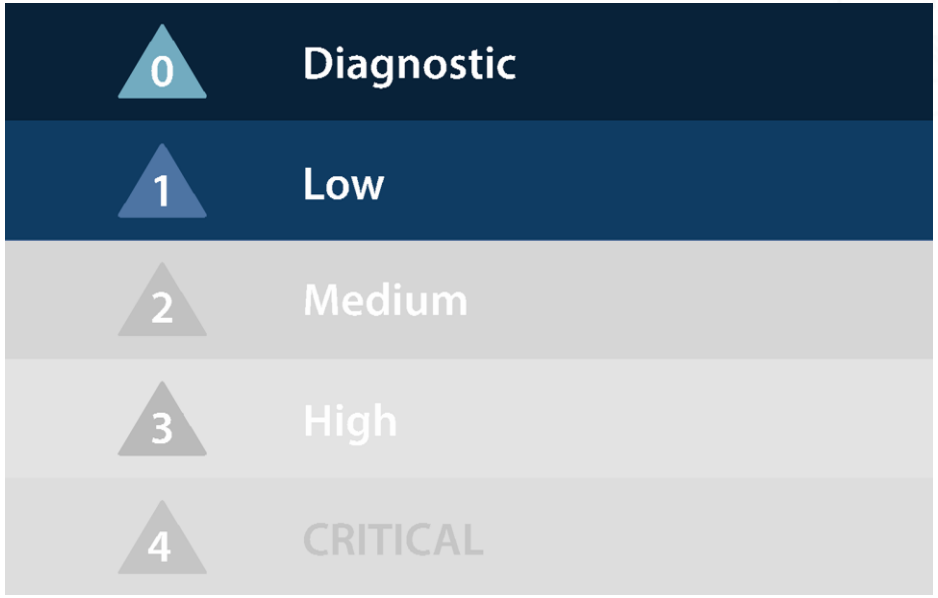
Manage Your Alarms

Use Hierarchy to Filter Alarms for Operators

Prioritize Your Alarms

Priority Levels:

- Set most alarms at a lower priority
- Set alarms that do not require a response as Diagnostic



Consolidate Alarms

Reduce the Number of Alarms

- Avoid alarm floods by consolidating multiple alarms into a single message

Shelve and Disable Alarms When Necessary

Shelving

- Temporarily silencing an alarm

Disabling

- Stopping an alarm from being evaluated

Can be used for nuisance alarms

Responsiveness

Responsive Design

- Design responds to user context
- Design responds to screen size

Corso Demo

Corso Demo

#ICCElevate Build-a-Thon! - September 28th

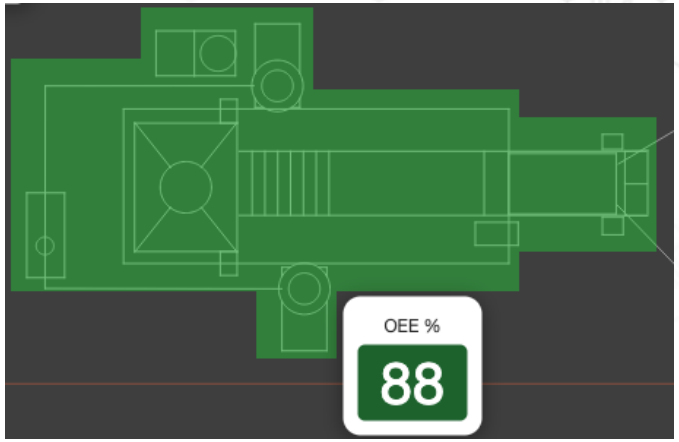
Focus on Each User's Needs (they're different)

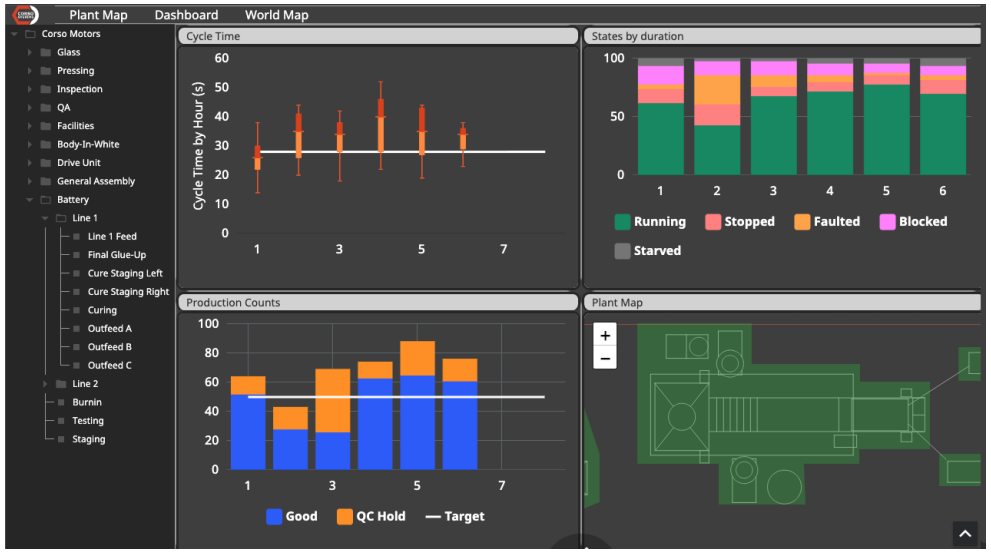
- Business
- Operators
- Investors/Customers

Corso Demo

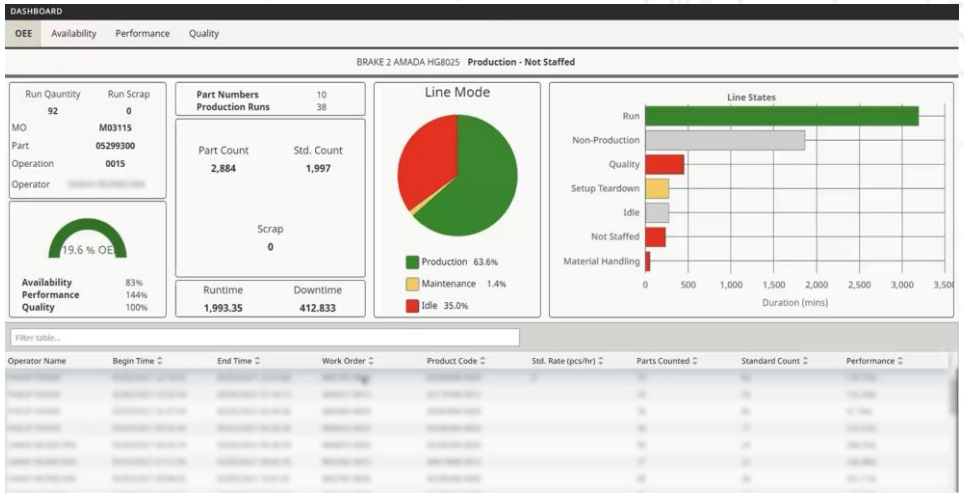
Business

- Answer Questions Quickly
  - High Level KPIs
  - Where are resources being lost?
  - How do we stop the bleeding?
- Map Scale Views
- Larger Scale Context
  - Site/Area/Line





Corso Demo



Operators

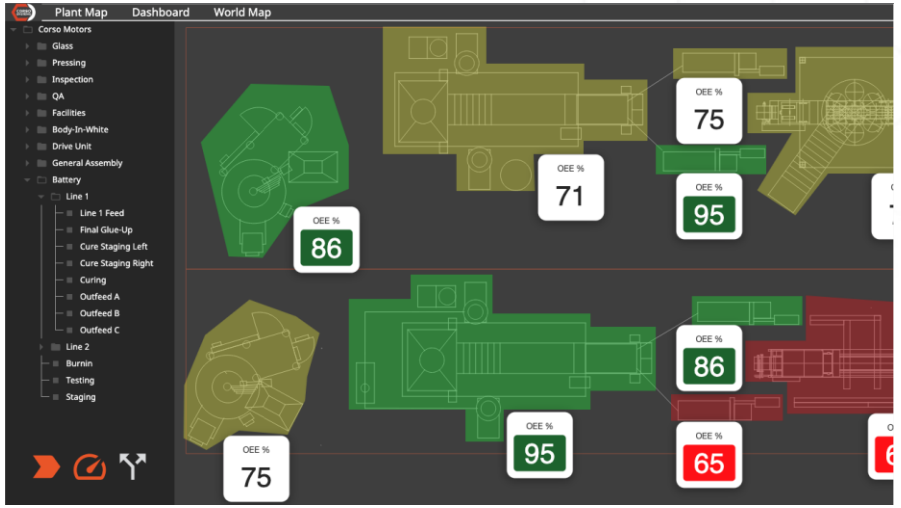
- Run the process
  - How to run the process efficiently
  - Real-time KPIs
  - Alarms & Upsets
  - What's coming next? (Production Schedules)
- Map Views plus Workcell HMIs
- Localized Context
  - (maybe) Area, definitely Line/Cell

https://icc.inductiveautomation.com/discover-gallery-detail/2021/corso-systems

Corso Demo

Investors/Customers

- On a plant tour they will want to see:
  - High Level KPIs
  - Process Flow Diagrams
  - *What is that robot doing right now?*
- Map Scale Views and Line level HMIs
- Need to build context for them
- Looks matter more



Kupper Demo

Kupper Demo

Practical Design Elements

- Organization
  - Hierarchical navigation, with all vital windows readily accessible. Avoid the situation where user is asking: “How did I get to that screen again?
  - Data grouped by source device and into practical groupings for interaction.

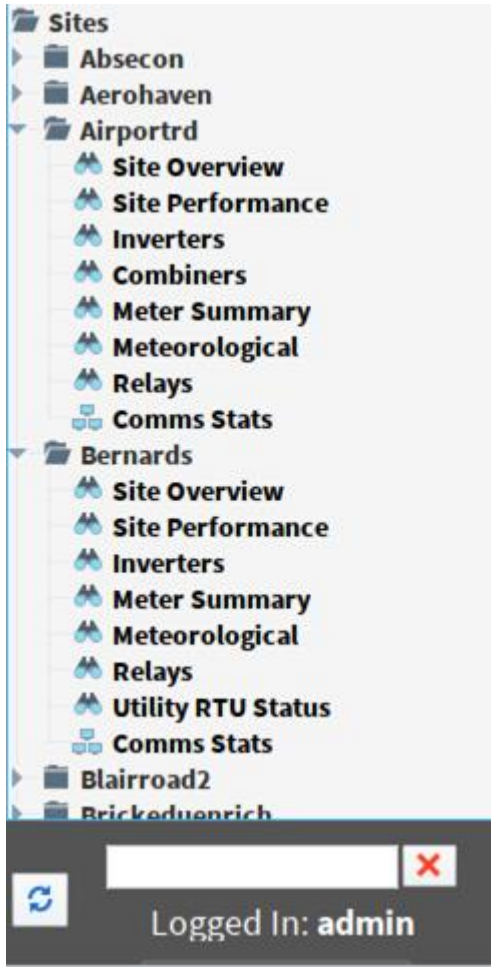
- Data with Context
  - Pre-built trends and sparklines in addition to full-customizable trending.
  - Sparklines when useful.
  - Data Analysis

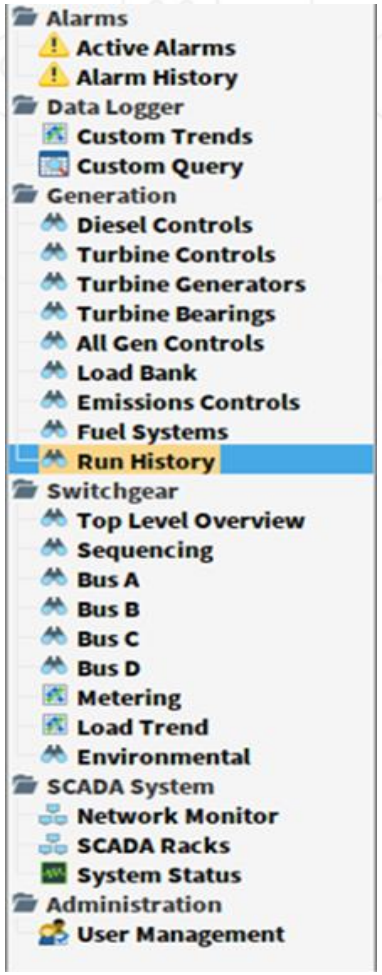
- Industry-Specific Features
  - Functionality created to augment the user’s workflows or to handle industry-specific challenges.

Kupper Demo

Organization - Navigation

- Navigation Organized by task and system.
- Filterable/Searchable if a large number of options.
- All options shown, except those the user does not have permission for. User does not have to click around in different screens hoping to find the right button.
- On page change, the highlighted window updates to reflect current location.

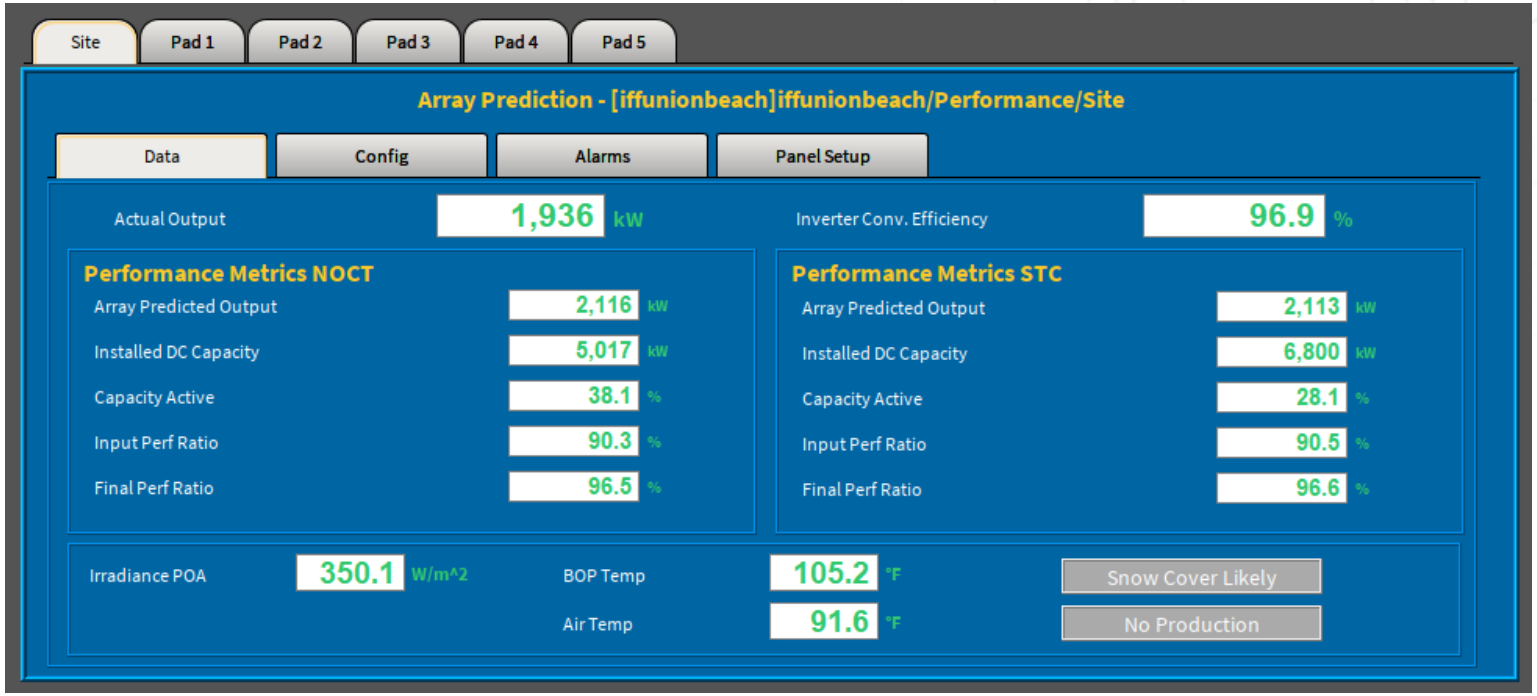




Kupper Demo

Organization - Navigation

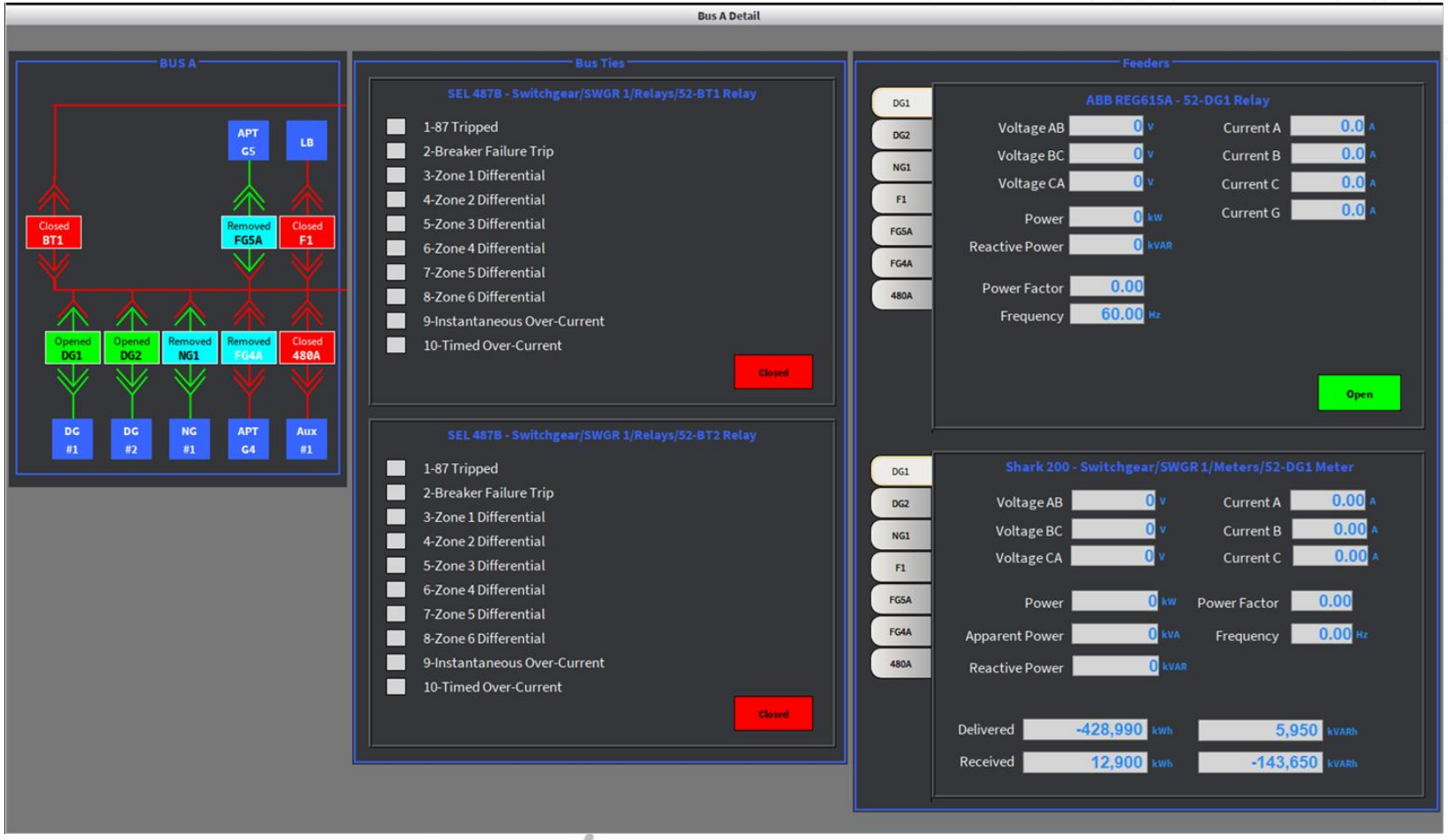
- Using a tabbed navigation to switch between similar devices can avoid a jarring window-change.
- Can also be used to indicate hierarchy or groupings of data.



Kupper Demo

Organization – Data by Device And Area

- Visual Layout organizing the data.
- The three columns in this screen represent progressively deeper information.
  - Bus Overview
  - Inter-Bus Alarms
  - Intra-Bus Devices and their data.



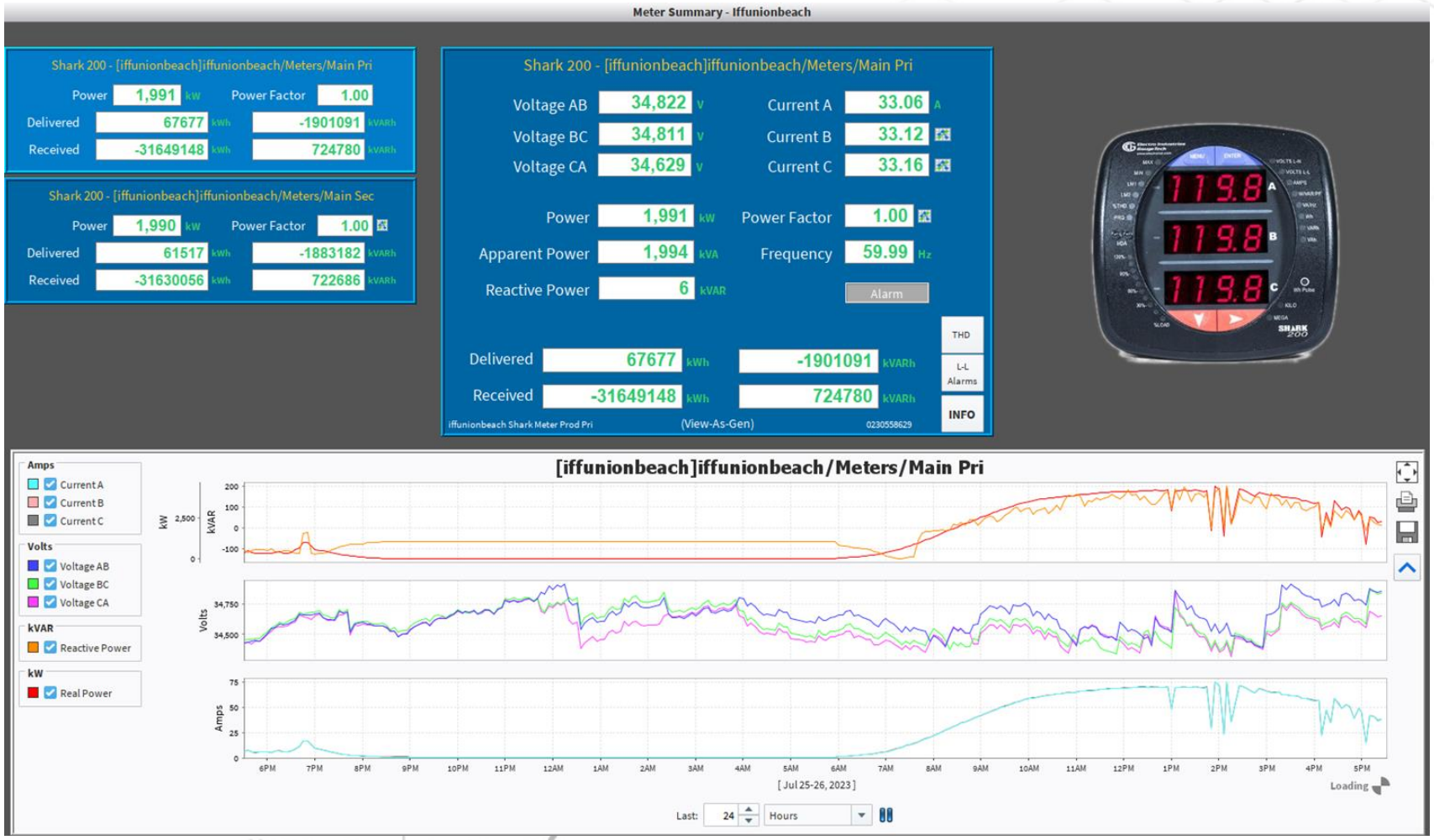
Kupper Demo

Data + Context = Information

Kupper Demo

Data + Context = Information

- Left Faceplates are preview of data and act as the selector. Highlighted faceplate is active.
- Central Faceplate shows full detail.
- Right Image shows the device as seen on site.
- Graph At Bottom for the selected device



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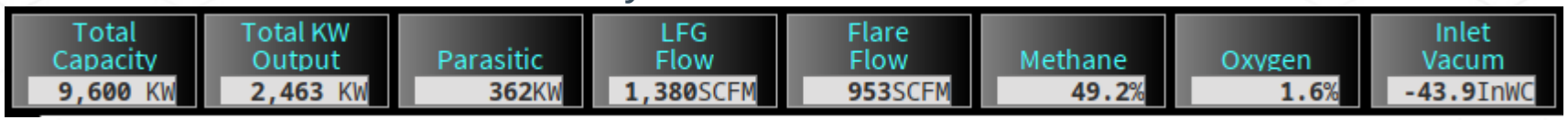
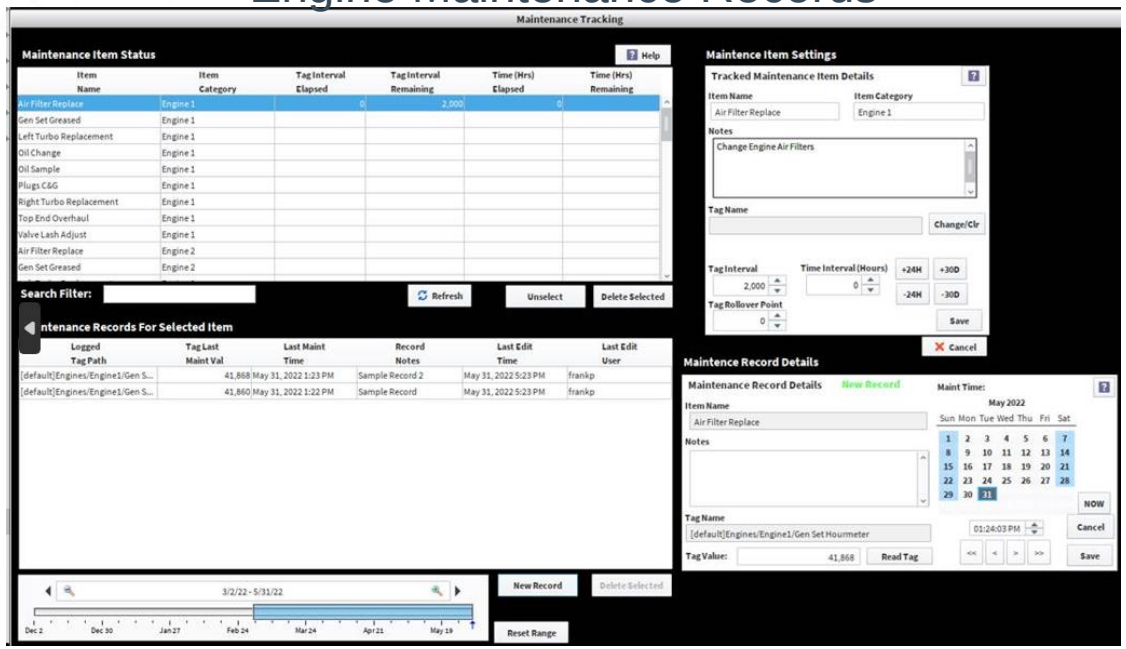
Kupper Demo

Industry-Specific Features

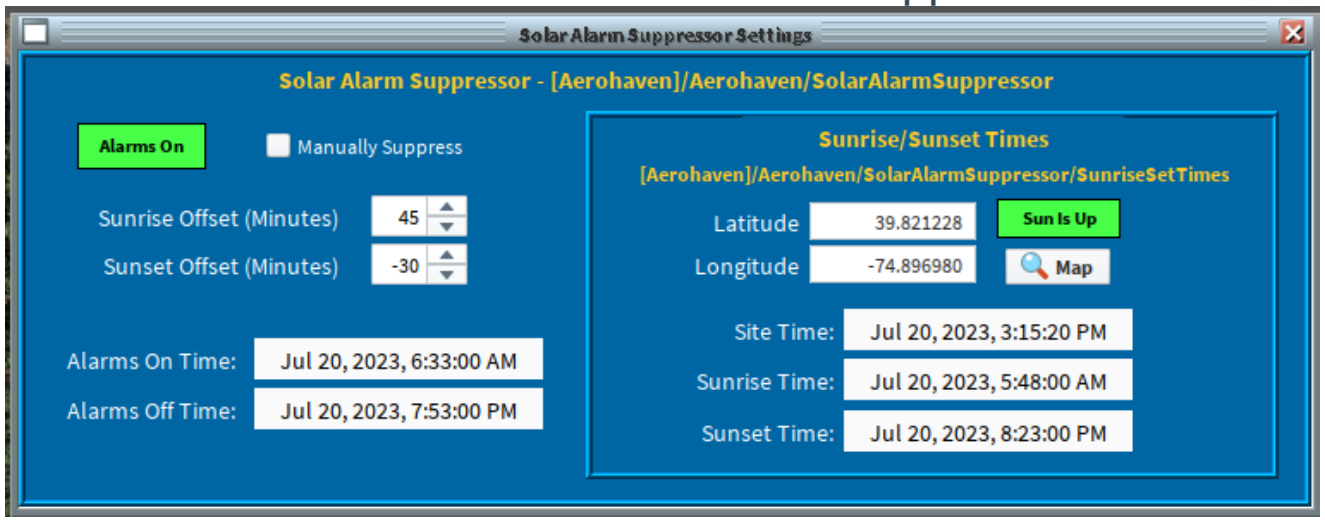
Always-Visible KPI's



Engine Maintenance Records



Sunrise/Sunset Based Alarm Suppression



ACC Demo

ACC Demo

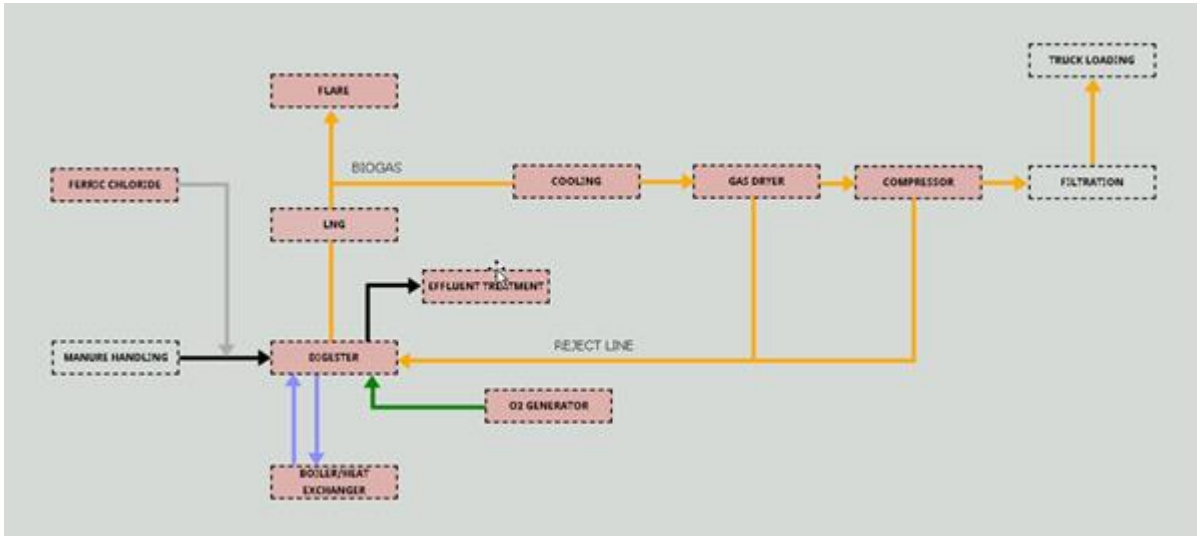
Practical Design Elements

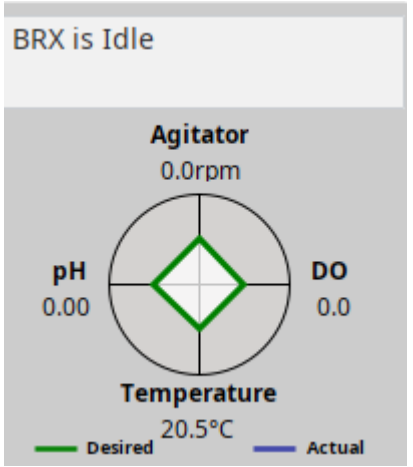
- Design specific for the Process Industries
  - Follow the ISA 101 Standard Guidelines
    - Navigation can be simple, intuitive
    - Limit the use of color for attention
    - At a glance status of a process
    - Human Factors Engineering
  - Follow the ISA 88 Standard Guidelines
    - Modular, reusable elements (Graphics, UDT and Control Logic)

ACC Demo

Overview Display

- At a glance process flow and status
- Situational Awareness

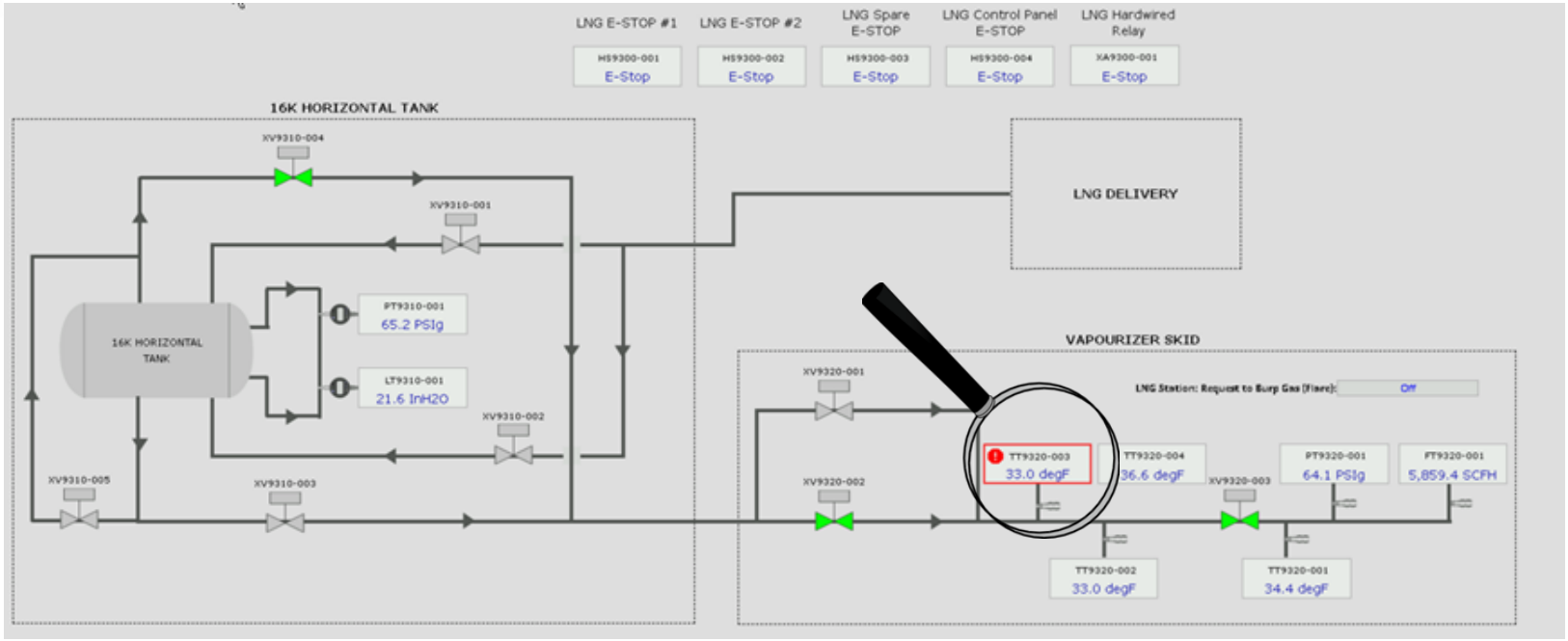




ACC Demo

Process Flow

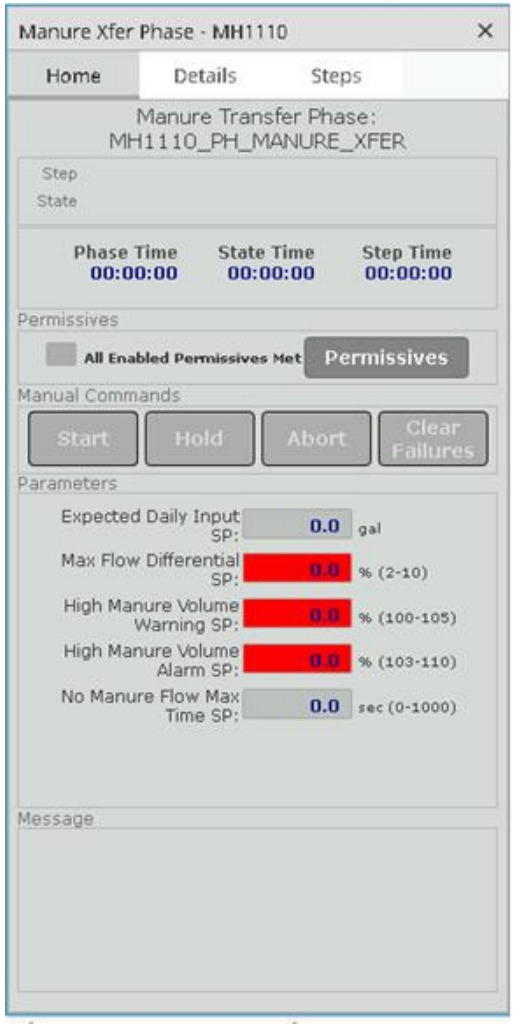
- Simplified process diagrams
- Mobile format
- Shape and color indicate process exceptions



ACC Demo

Intuitive Control

- Monitoring modular phase logic control
- Consistent Design
- Organizing each faceplate logically
- Process steps clearly described



Industry-Specific HMIs

Compare & Contrast

- Overlap between industries
  - Navigation
  - Reusability
  - High Performance
  - Alarms
  - Responsiveness
- Design that differentiates

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